



Program Executive Office  
Assembled Chemical Weapons Alternatives

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A Partnership for Safe  
Chemical Weapons  
Destruction



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## Characteristics of Nerve Agents

The Program Executive Office, Assembled Chemical Weapons Alternatives, known as PEO ACWA, is responsible for the safe and environmentally compliant destruction of the chemical weapons stockpiles stored at the Pueblo Chemical Depot in Colorado and the Blue Grass Army Depot in Kentucky. Currently, the program is building state-of-the-art pilot plants that will safely and efficiently destroy these chemical weapons stockpiles. The safe, secure storage of these remaining chemical weapons in the U.S. Army inventory is the responsibility of the U.S. Army Chemical Materials Activity.

The Pueblo stockpile consists of 2,611 tons of mustard agent in projectiles and mortar rounds, and the Blue Grass stockpile is comprised of 523 tons of nerve and blister agents stored in rockets and projectiles.

**What are nerve agents?** There are two types of nerve agents currently stored in the U.S. chemical weapons stockpile: VX and GB. These nerve agents are members of the organophosphate family. Nerve agent VX, a clear, odorless and tasteless liquid, has an appearance similar to motor oil. VX can become an aerosol (very small droplets) through explosion or a vapor through ignition. It is heavier than water and evaporates 2,000 times more slowly. Highly toxic in its liquid, aerosol and vapor forms, VX is the most hazardous when absorbed through the skin. As a vapor or aerosol, it can be inhaled and absorbed through the lungs or through the digestive system if eaten or swallowed.

Nerve agent GB, also known as sarin, is one of the most toxic members of the organophosphate family. Under normal conditions, it is a clear to straw-colored liquid and has approximately the same density and evaporation rate as water. GB presents the greatest hazard when released in vapor form. Such vapors can be released only by evaporation of the liquid or vaporization into the air.

**Where is nerve agent stored?** A stockpile of projectiles and rockets containing nerve agents GB and VX is stored at the Blue Grass Army Depot, Ky. As a signatory to the Chemical Weapons Convention, the United States has destroyed nearly 90 percent of its original chemical weapons stockpile, which was successfully completed by the U.S. Army Chemical Materials Activity in January 2012. The remaining stockpiles in Blue Grass and Pueblo represent the 10 percent for which PEO ACWA is responsible.

Chemical weapons containing nerve agent VX have been previously destroyed at Newport, Ind. In addition, chemical weapons containing both nerve agents GB and VX have been previously destroyed at Anniston, Ala.; Pine Bluff, Ark; Umatilla, Ore.; Tooele, Utah; and Johnston Atoll, a group of islands about 800 miles southwest of Hawaii.

**What are the dangers of nerve agent exposure?** Exposure to nerve agent affects the nervous system by interfering with the signals sent from the brain to the vital organs and other parts of the body. Nerve agent inhibits the action of the enzyme acetylcholinesterase, preventing messages from the brain from reaching the nerve endings. As a result, hyperactivity occurs in the organs stimulated by these nerves

Low Dose Symptoms	High Dose Symptoms
<ul style="list-style-type: none"> <li>increased saliva production</li> <li>runny nose</li> <li>chest pressure</li> <li>headache</li> <li>deterioration of short-range vision</li> <li>tiredness</li> <li>slurred speech</li> <li>hallucinations</li> <li>nausea</li> </ul>	<ul style="list-style-type: none"> <li>difficulty breathing</li> <li>cough</li> <li>cramps</li> <li>vomiting</li> <li>involuntary discharge of urine/defecation</li> <li>powerful discharge of saliva</li> <li>running eyes</li> <li>sweating</li> <li>muscular weakness</li> <li>tremors</li> <li>convulsions</li> <li>loss of consciousness</li> <li>death</li> </ul>

Nerve agents can affect both the respiratory muscles and the respiratory center of the nervous system. The combination of these two effects causes death by respiratory failure.

First aid treatment consists of decontamination (household bleach can be used), the injection of atropine and 2 PAM Chloride (they must be injected immediately after exposure to be effective) and artificial resuscitation (when applicable).

**Is the stored nerve agent a risk to the public?** It is unlikely that any accident in storage could cause a risk to the public in surrounding communities. It would take an accident in storage such as an explosion or fire in order for the public to be exposed to nerve agent from the Army's chemical weapons stockpile; even then the likelihood of danger to the public is remote. In a fire, most of the nerve agent would burn up, but some would stay in the smoke. Emergency officials call this smoky cloud and the invisible parts around it the plume.

If an accident occurred, a plume would drift away from the scene, and small drops of nerve agent might fall to the ground. These small drops would be harmful if they contact the skin or if contaminated food or drink is ingested.

Some tiny parts of the nerve agent, called vapor, would remain in the plume. Vapor inhalation is harmful. Because the vapor would travel farther from the accident, it would be the greater danger over a large area. However, the vapor becomes less harmful the farther the plume travels because wind mixes clean air with the contaminated air as the plume travels. The clean air dilutes the agent until it is no longer harmful.

To better understand the difference between aerosol and vapor, think of perfume. Like nerve agent, perfume in a bottle is liquid. If perfume is sprayed on someone, drops will cling to the skin, hair and clothes. If sprayed on the other side of the room, the aerosol drops would not come in contact with skin or clothing but the fragrance is detectable. That fragrance is the vapor. However, nerve agent vapor is invisible and has no odor.

**What actions should be taken if nerve agent exposure occurs?** Avoiding the nerve agent vapor should always be the primary goal. However, if symptoms of nerve agent exposure develop, get medical help immediately.

Anyone outside before taking shelter or leaving the area who suspects nerve agent exposure can do several things. If in a sealed shelter, take off outer clothing, put them in a plastic bag and seal the bag. If water is available in the shelter, wash or take a cool to warm (not hot) shower, using a lot of soap and water. Do not put soap in eyes; just use lots of water. If leaving the area, tell responders or medical staff of suspected exposure. Tell emergency responders about the sealed bag so that they can arrange for its safe removal after the emergency.

Treatment for nerve agent exposure varies. If nerve agent is inhaled, individuals should hold breath until a respiratory protective mask is in place (if available).

Mouth-to-mouth resuscitation can be given to a victim who has stopped breathing after agent inhalation except if facial contamination exists. Seek medical attention as soon as possible.

If nerve agent gets in the eyes, immediately flush with water for 10-15 minutes, and then put on a respiratory protective mask (if available). Seek medical attention.

If nerve agent comes in contact with the skin, put on a respiratory mask (if available) and remove any contaminated clothing. Immediately wash contaminated skin with copious amounts of soap and water, 10 percent sodium carbonate solution or 5 percent liquid household bleach. Rinse well with water to remove excess decontaminate and seek medical attention.

If nerve agent is ingested, seek medical attention immediately. The first symptoms are likely to be gastrointestinal, but vomiting should not be induced.